

Atty. Docket No. 2003-1969.ORI

5                    **BIODEGRADABLE CORROSION INHIBITOR COMPOSITION**

**Field of the Invention**

                  The present invention relates to vapor phase corrosion  
inhibitor compositions generally, and more particularly to  
water-soluble vapor phase corrosion inhibitor compositions  
10   that are specifically formulated to provide enhanced  
corrosion inhibiting properties for application throughout a  
protected target.

**Background of the Invention**

                  Vapor phase corrosion inhibitor materials have been  
15   utilized in a variety of applications for protecting  
typically metal devices or components thereof from vapor  
phase corrosion thereof. Conventional corrosion inhibitor  
materials are typically specifically adapted to protect  
particular metals. Further, such conventional corrosion  
20   inhibitor materials find difficulty in being universally  
applied in both solid and aqueous form, with such  
conventional materials displaying certain drawbacks in such  
applications.

                  For example, conventional inhibitor materials typically  
25   do not provide multi-targeted corrosion protection in a  
single composition. Further, such materials tend to lack  
the capability of creating a corrosion barrier upon contact  
with the targeted surface. Since corrosion inhibitor  
materials are often times utilized in applications where  
30   environmental sensitivity is critical, it is an important  
feature of such materials to be environmentally friendly,  
and preferably substantially biodegradable. A particular

example of such an application is in the corrosion protection of corrosion-susceptible components in hydrotesting fluid conduits such as petroleum pipelines.

For example, in 1995, the Norwegian Pollution Control  
5 Authority (SFT) implemented the OSPAR Harmonized Offshore  
Chemical Notification format (HOCNF). Its primary function  
is to document and control the environmental properties of  
offshore chemicals. HOCNF documentation tracks chemical  
10 ingredients as well as toxicity, biodegradation and  
bioaccumulation testing data. SFT issues discharge permits.  
These permits enable the operating oil companies to change  
chemicals without additional permits provided that the  
environmental risks do not increase. These permits require  
15 the operator to gradually and systematically replace  
chemicals that have questionable environmental effects with  
less harmful products. All operators are held to the same  
strict discharge regulations.

The use of traditional petroleum oil based products and  
other hazardous chemicals has been under severe scrutiny.  
20 Oil based products not only pose hazards to the environment  
and the operators, but they also fail to perform well in  
applications such as hydrotesting. In addition many of  
these products are difficult to use and remove.

It is therefore a primary object of the present  
25 invention to provide a water-soluble corrosion inhibitor  
composition that is substantially biodegradable, and is  
adapted to be effective in protecting a variety of  
corrosion-susceptible materials.

It is a further object of the present invention to  
30 provide a water-soluble corrosion inhibitor composition  
which enables corrosion protection on contact with targeted  
surfaces of corrosion-susceptible materials.

It is a still further object of the present invention to provide a water-soluble corrosion inhibitor composition that is specifically adapted to be dissolved in water at a concentration of between about 0.25 percent and about 5 percent by weight without substantially altering the flowability characteristics of the water.

#### Summary of the Invention

We have found that selected biodegradable chemicals can be utilized as a dry fogged vapor corrosion inhibition system or in a water solution for treating metallic surfaces of all kinds. When fogged into closed spaces that can be sealed, effective long-term protection is provided. The system can be easily removed with a water wash if needed. In other applications, spraying as little as a 1% solution in water is effective, and if sealed after treatment, will provide long-term protection against corrosion. The vapor-phase inhibiting action protects inaccessible and recessed surfaces, and if the vapor phase inhibition layer is distributed the layer is replenished by the continuous vapor redistribution.

In a particular embodiment of the present invention, a water-soluble corrosion inhibitor composition includes between about 90 and about 99 percent by weight ammonium benzoate, and one or more additive components in an amount of between about 1 and about 10 percent by weight of the composition. The one or more additive components are selected from the group consisting of silica, triazoles, and wetting agents.

Preferably, the corrosion inhibitor composition is adapted to be dissolved in water in an amount necessary to

form an aqueous solution having about 0.25 to about 5 percent by weight of the corrosion inhibitor composition.

#### Detailed Description of the Preferred Embodiments

5       The objects and advantages enumerated above together with other objects, features, and advances represented by the present invention will now be presented in terms of detailed embodiments. Other embodiments and aspects of the invention are recognized as being within the grasp of those  
10       having ordinary skill in the art.

#### Example 1

Benzoic acid was reacted with  $\text{NH}_3$  gas in a pressure vessel to produce the ammonium benzoate salt, which is the  
15       main component of the new systems.

Ammonium Benzoate               95%

Sodium sulfonate               5%

Sodium sulfonate is available, for example, from Akzo Nobel as Petro 22.

20       When the above composition is used as a 0.25% to 2% solution in water, a very effective corrosion inhibition wash system is produced. A 2-3% solution is preferably used during hydrotesting and for the preservation of internal surfaces on pipes and vessels. The addition of the 5%  
25       sodium sulfonate acts as a wetting agent and substantially increases the solubility of the ammonium benzoate.

#### Example 2

Ammonium Benzoate               93%

30       Silica                       5%

Benzotriazole               2%

The benzotriazole is available from PMC Specialties Group. An especially suitable silica is available from Horton Earl Co as Sipernant 50 S.

Ammonium Benzoate mixed with silica and triazole to form a dry powder mix is particularly effective for fogging into closed spaces. The combination of silica to prevent clumping and triazole for non-ferrous metal protection provides multi-metal protection against corrosion. It can be easily removed with a water wash.

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Example 3

Ammonium benzoate	97.5%
Benzotriazole	2%
S-5	0.5%

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S-5 is an imidazoline acetate available from Mona Industries as Monazoline "T".

The combination of ammonium benzoate, sodium triazole and a wetting agent such as S-5 was used at a 1-3% solution for engines and ballast tanks during shipping and storage.

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Example 4

Ammonium benzoate	95%
Silica	5%

A system especially suitable for fogging into closed spaces was prepared from by blending about 5% silica with ammonium benzoate. The silica is useful in preventing clumping when fogged in any process where humidity is a factor.

The compositions described in Examples 1 and 3 are particularly suitable for packaging in water soluble bags for ease of handling. Examples of such water soluble bags are disclosed in the United States Patent Nos. 6,085,905 and

6,280,528, issued to the same assignee as in the present application.

The invention has been described herein in considerable  
5 detail in order to comply with the patent statutes, and to  
provide those skilled in the art with the information needed  
to apply the novel principles and to construct and use  
embodiments of the invention as required. However, it is to  
be understood that various modifications can be accomplished  
10 without departing from the scope of the invention itself.